Double convection of unsteady MHD Non-coaxial Rotation Viscous Fluid in a Porous Medium

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ABSTRACT

In this paper, the effects of heat and mass transfer (double convection) on unsteady magnetohydrodynamic flow of incompressible viscous fluids in a porous medium under the influence of non-coaxial rotation are analyzed. The flow is induced due to buoyancy force and oscillating bounding disk. The dimensionless governing equations for the velocity field, temperature and concentration distributions are solved analytically by using the Laplace transform technique. The results for skin friction, Nusselt number and Sherwood number are also presented. The numerical results are computed for the effects of various indispensable flow parameters and displayed using several graphs. The numerical results showed the behavior of the physical parameters on the fluid flow in primary and secondary velocities as well as on heat and mass transfer. It is found that the velocity profiles for solution that considering heat and mass transfer are higher compared to solution without mass transfer. Physically, mass is a particle that transfers heat energy from one place to another place and enhances the velocity to increase. It is worth mentioning that the analytical solutions are in excellent agreement with the numerical solutions obtained by Gaver–Stehfest algorithm and present solutions are found identical with the published results.

KEYWORDS:

Non-coaxial rotation; MHD; Porous medium; Laplace transform; Heat and mass transfer